Aalto University
School of Science

CS-E4660 Advanced Topics in Software Systems

Hands-on tutorial: Machine Learning Serving

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Who I am? and what is this tutorial about?

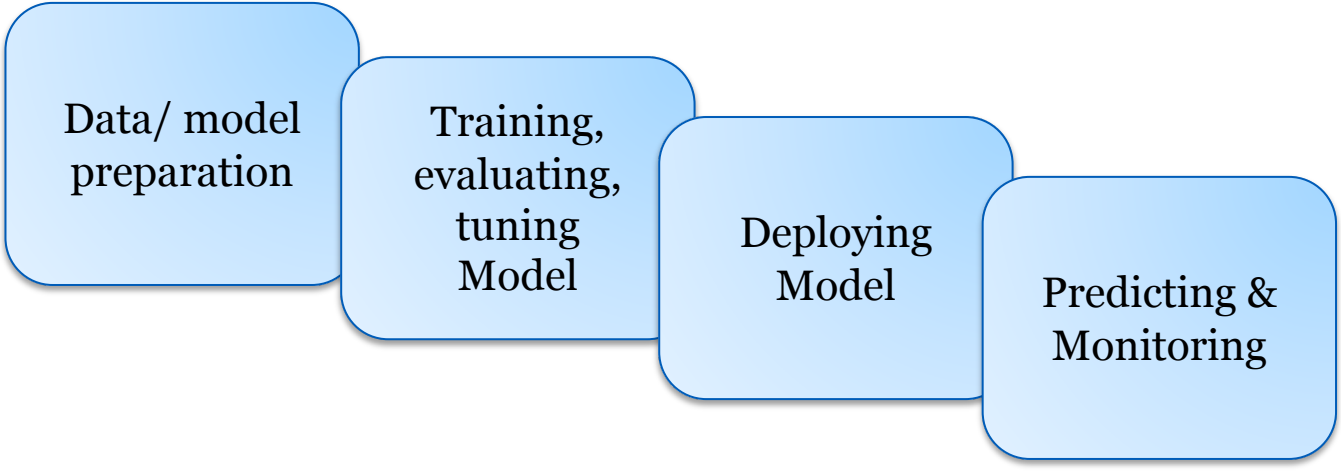
- **Who I am?**
  - I am Minh Tri Nguyen
  - MSc degree in Computer Science in 2019
  - PhD student at Aalto University
- **What is this tutorial about**
  - An overview about Machine Learning (ML) Serving
  - A quick demo of deploying a simple ML serving cluster.

Overview

- **Microservices architecture**
  - Due to the high demand for diverse and flexible cloud service, microservices are emerging as a convenient way of deploying and managing software services. Instead of monolithic or linear logic block, the idea is to separate the whole service into microservices such as front-end, database, authentication & authorization, machine learning services, and so on. This approach allows modular programing at the microservices level, enabling code re-use and re-combine as needed.
- **Common commercial ML serving Platforms**
  - Google AI Platform, Microsoft Azure, Prediction IO, ...

ML Serving

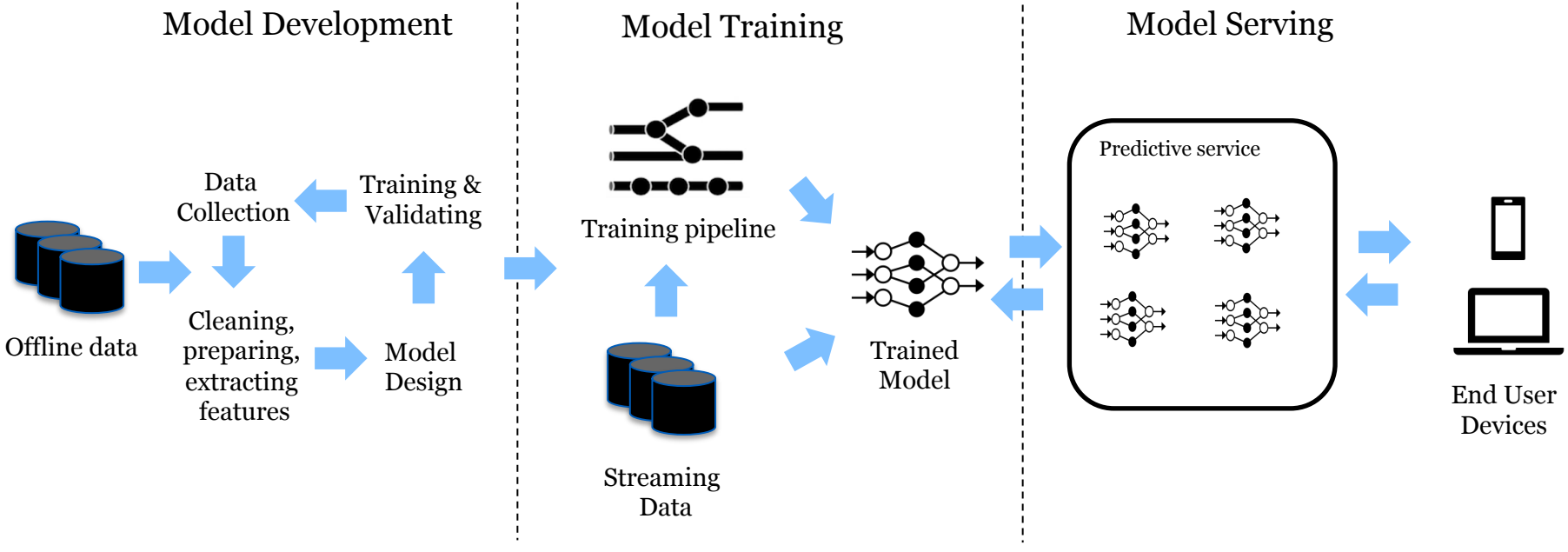
- **ML Workflow**



- **Other stages**
  - Package model, update & version control…

ML Serving

- **Lifecycle**



Requirements for ML Serving

- **Performance**
  - Latency
  - Accuracy
  - ...
- **Scaling/Replicas**
- **Elasticity**
- **Cost**
- **Versioning models**
- Multiplex Models
- Batch processing

Approaches

- **Embed model in the web server**
  - Simple
  - End to end model control
  - Model load once, no isolation, no fine-grained replication
  - Pooling based process – memory issue with multi-model deployment
  - Hard to deploy complex pipeline

Approaches

- **Offload model to external service (cloud,…)**
  - Communication (API, …)
  - Depend on cloud services (QoS, …)
  - No infrastructure management
- **Private Cluster**
  - End to end model control
  - Privacy

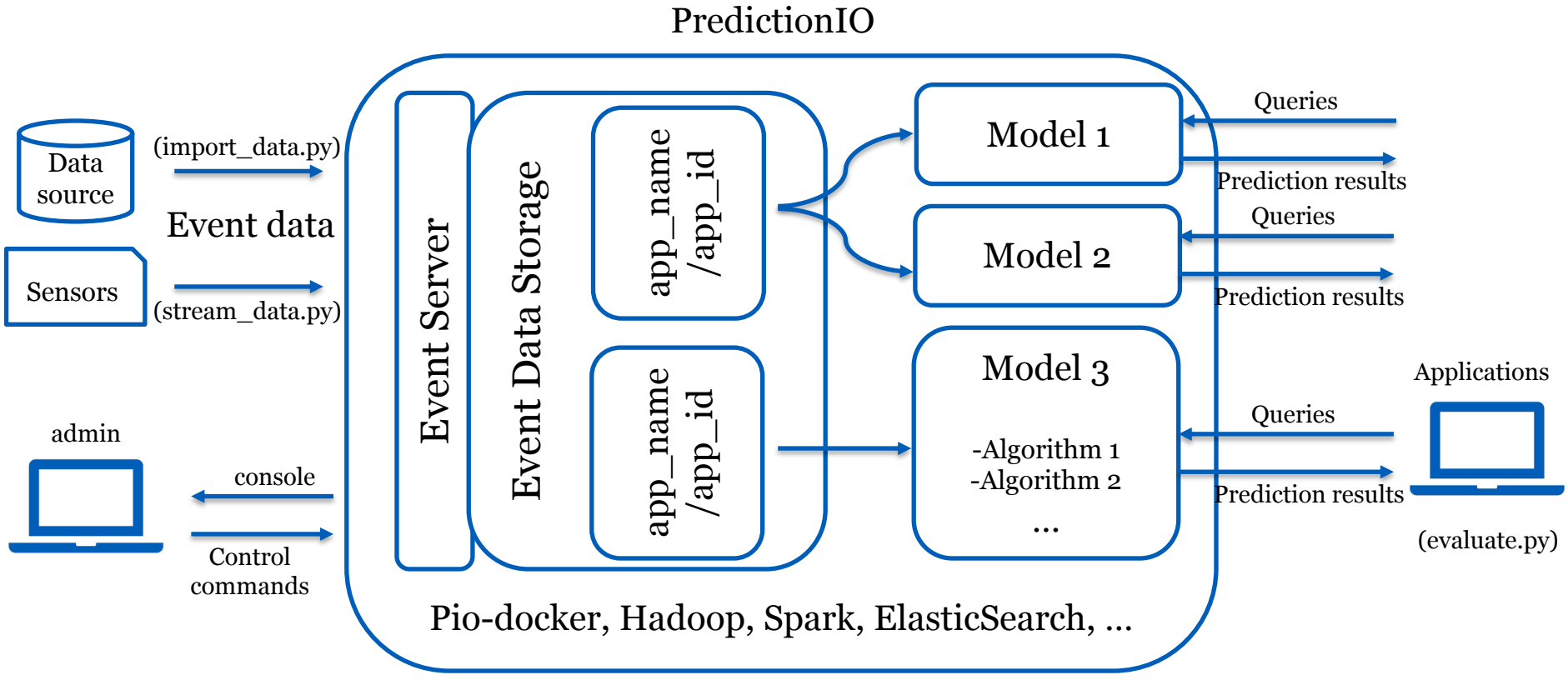
➢ Separate service management

➢ Allow complex model deployment

A Quick Guide for ML Serving Cluster

- **Prerequisite**
  - Docker desktop
  - PredictionIO (docker, library)

A Quick Guide for ML Serving Cluster



Contact and References

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- https://cloud.google.com/ai-platform/docs/technical-overview
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